

# Using Accounting Ratios in Predicting Financial Distress: An Empirical Investigation in the Vietnam Stock Market

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## **Abstract**

*Financial distress prediction is an important and practical research topic for many stakeholders and has attracted extensive studies over the past decades. This paper investigates the challenging issue of financial distress in Vietnam by distinguishing “healthy” companies from “financially distressed” companies using a data sample of firms listed on the Ho Chi Minh City Stock Exchange. Employing the logistic regression model to predict financial distress with a unique data set, we characterize the determinants of financial distress in terms of firm accounting and financial ratios over the period from 2007 to 2012. The results indicate that financial ratios can be employed as an early warning of financial distress as financial ratios are significantly correlated with the probability of firm financial distress.*

**Keywords:** Financial distress; insolvency; logit.

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## 1. Introduction

The recent bankruptcies of many large corporations all over the world have underlined the importance of default prediction both in academia and in industry (Hol et al., 2002). These catastrophic corporate failures highlight the need to develop early warning systems that can help prevent or avert corporate defaults. This also facilitates the investment selection of firms to collaborate with or to invest in. In many developed countries, research on default prediction has been conducted for many decades. Moreover, a very large volume of empirical studies has been published in the literature since the pioneering work of Beaver (1966; 1968) and Altman (1968). However, there is still a light literature in Vietnam investigating this topic.

Financial distress is a term in corporate finance used to indicate a condition when debt payment commitments to creditors of a company are broken, or these debt commitments are honored with difficulty. It is common that financial distress is a serious problem which could lead firms to bankruptcy. Financial distress is usually associated with a huge burden to the company. These burdens are termed as costs of financial distress. When a firm is under financial distress, there are many associated unexpected problems including but not limited to the reduction of management efficiency, higher costs of raising capital, concerns of customers canceling orders leading to sale squeeze, decreasing turnovers and subsequently a drop in firm value (Bae, 2012).

The possible occurrence of financial distress and insolvency situations are a serious threat to the various economic agents holding an in-

terest in the insolvent firms. The failure of a firm involves many parties with huge costs. Therefore, research focusing on corporate failure prediction providing a better understanding on the topic has attracted interest from many stakeholders, including not only academic but also private agents and government.

A great deal of research has developed failure prediction models based on different modeling techniques (Altman and Narayanan, 1996). Altman (1968) and Beaver (1966) are amongst the first to identify the characteristics of failing firms in comparison to a matched paired sample of healthy firms. Many papers provide empirical evidence of the prediction of financial distress using financial accounting indicators.

There have been many firms facing financial difficulties in the last few years in Vietnam. However, there has been a light volume of research on this topic employing Vietnamese firm data to investigate this issue. Therefore, it is important to provide a thorough investigation examining the use of financial ratios in predicting financial distress in the context of Vietnam. This paper investigates the impacts of financial variables on financial distress of Vietnamese firms for the period from 2007 to 2012. This study is definitely relevant and useful for both private entities and governmental institutions for assessing firm financial condition and investment process.

The rest of the paper proceeds as follows. Section two reviews the literature on this topic. Section three presents the data. Section four describes the research method. Section five reports results and discussion of results. The final section provides conclusions to the paper.

## 2. Literature review

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There has been a continuous effort and there is a huge volume of empirical papers contemplating explanations for, and predictions of, financial distress from the different perspectives of finance, economics and accounting. However, the lack of a common theory explaining the use of financial indicators in financial distress prediction provokes different applications of different financial ratios in predicting financial distress. Various financial distress prediction models in the current literature have been adapted to account for differences between countries and industry specific characteristics. All of these factors are normally the motivations for further research in the application of financial distress prediction models in terms of early warning indicators from various financial ratios.

A number of theories have been developed in order to explain financial distress and corporate failures. However, different theories provide explanations for financial distress from different angles. For example, normative theories tend to provide explanations for the reasons causing corporate failures and this is termed as deductive reasoning. Positive theories introduce explanations why corporations do fail in practice and this is termed as inductive reasoning. According to Charitou et al. (2004), although the majority of bankruptcy studies were conducted in line with the positivistic paradigm, very few researchers clearly identified an underlying theory.

Academic research on financial distress started to rise in the developed Western countries in the 1960s following an increasing number of firm collapses during that time. Beaver (1966) employs univariate analysis to predict corpo-

rate financial distress and finds that different financial ratios have different discriminant ability. This research basically develops a cutoff threshold value for each financial ratio in order to classify firms into two groups. After analyzing these traditional financial ratios, statistical linear models are to be applied to provide a model for corporate financial distress prediction. Altman (1968) employs multiple discriminant analysis to investigate the financial distress of firms by computing an individual firm's discriminant score using a set of financial and economic ratios. The model performance is superior for the two years before financial distress actually happens in firms, and then deteriorates substantially thereafter. Ohlson (1980) introduces the logistic regression model with a sigmoid function to the financial distress prediction. Compared to the multiple discriminant analysis, the logistic regression model is easier to understand since the logistic score, taking a value between 0 and 1, is simply interpretable in a probabilistic way (Bae, 2012).

Previous papers investigating corporate financial distress in the current literature normally employ binary classification of firms in the dataset into different groups to identify distressed firms. The aim of this classification is to classify a firm observation into one of the two distinguished groups – failed or non-failed companies. Previous papers also use various variables including financial ratios and/or other characteristics of the firms in a given period of time. Conclusions of the previous studies in financial distress prediction literature confirm that financial accounting ratios can be employed to predict financial distress. According to Andreev (2007), all financial distress models

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share a common static methodology, whereby they perform statistical analysis to distinguish between financial states in the last year prior to failure. In addition, the results of almost all of papers in the literature converge toward the conclusion that distressed companies differ significantly from healthy ones for the examined period.

### 3. Data

Our data are collected from different sources. The financial statements are downloaded from the websites of the Ho Chi Minh City Stock Exchange and the Hanoi Stock Exchange. The sample includes firms listed in both the Ho Chi Minh City Stock Exchange and the Hanoi Stock Exchange for the period from 2007 to 2012. We divide our data sample into two groups. The first group comprises financially distressed firms which includes firms being delisted. This group consists of 28 listed companies classified as being in financial distress. The second group includes healthy firms (firms without financial distress) or active firms that satisfy the following criteria:

- Firms must not violate the listing requirements that maybe lead to situations including being warned, put under control, under trading suspension and being delisted during the researched time.

- The firms must be listed on the stock exchanges before 2007.

- Firms' financial statements must be fully available for data collection during the research time.

For each year of data, listed companies in the data sample are categorized as either financially stable or financially distressed according

to the firm's financial situation. Some firms are delisted during the research period and we exclude them from the data sample. Therefore, financial data relating to these firms do not meet the criteria of four consecutive years. The final data sample includes 946 non – financially distressed observations and 36 financially distressed observations.

### 4. Research methods

The analytical technique employed in identifying financial distress of firms should allow for a binary dependent variable in the regression analysis. This requirement essentially rules out usual regression analysis, including the common linear probability model. The initial approach for predicting corporate failure in the literature is normally to apply a statistical classification technique (discriminant analysis) to a sample containing both failed and non-failed firms as indicated in Deakin (1972) and Altman et al. (1977). However, this method is claimed to be liable to many defects because it largely depends on some restrictive assumptions such as linearity, normality, and independence amongst input variables. In addition, a pre-existing functional form relating to the dependent variables and independent variables is normally identified (Eisenbeis, 1977; Elloumi and Gueyié, 2001; Nam and Jinn, 2000; Ong et al., 2011; Ugurlu and Aksoy, 2006). Moreover, the assumptions of this method, especially on the multivariate normality of data, are not examined by most of the studies. Therefore, according to Karels and Prakash (1987), discriminant analysis could only be optimal if the normality conditions are satisfied. If this normality assumption does not hold strong, the result of the model is deemed invalid (Ong et al., 2011).

To overcome that problem, emphasis tends to shift toward probit and/or logit analysis in a number of papers. Martin (1977) and Ohlson (1980) are among the first studies applying these techniques, followed by many papers including Wiginton (1980), Zmijewski (1984), Zavgren (1983), Aziz and Lawson (1989), Lennox (1999) and Westgaard and Van der Wijst (2001). Since the method is employed in many previous studies, we employ logistic regression for our analysis in this paper. Our model is formulated as follows:

$$\text{Ln} \frac{P_i}{1 - P_i} = \beta_0 + \beta_1 * \text{WOCA} + \beta_2 * \text{PROFIT} + \beta_3 * \text{EPS} + \beta_4 * \text{LEVERAGE} + \beta_5 * \text{CASH} + \beta_6 * \text{TURN} + \beta_7 * \text{S\_CASH} + \beta_8 * \text{S\_RECE}$$

where  $P_i$  is a variable to represent a company's financial state, which has been defined as a dichotomous variable in which state 1 and state 2 are non- financial distress (active) and financial distress listed companies respectively. A company in state 1 is considered to be a healthy company that does not violate the listing requirements. State 2 is a financial distress company as defined in the data section.

The independent variables that are commonly employed in the literature to predict financial distress are:

- WOCA represents the working capital ratio of firm, which is computed by the difference of current assets and current liabilities divided by total assets.

- PROFIT is gross profit margin of firm, which is defined as the difference of net sales and cost of goods sold divided by net sales.

- EPS is earnings per share, which is computed by dividing net income divided by the number of shares outstanding.

- LEVERAGE is a proxy for financial leverage, which is computed as the sum of current liabilities and long-term debt divided by total assets.

- CASH is cash flow per share of firm, which is calculated by dividing the sum of net income and depreciation by number of shares outstanding.

- TURN is asset turnover of the firm, which is computed as the ratio of sales to total assets.

- S\_CASH is the ratio of sales to cash, which

**Table 1: Summary Statistics of Variables**

Variables	Healthy group		Financial distress group	
	Mean	Std. Dev.	Mean	Std. Dev.
<b>WOCA</b>	0.219277	0.221556	0.076828	0.333859
<b>PROFIT</b>	0.233103	0.269529	0.083545	0.350542
<b>EPS</b>	0.003399	0.003876	-0.00283	0.004774
<b>LEVERAGE</b>	0.491947	0.218943	0.562112	0.248038
<b>CASH</b>	0.012787	0.012736	0.003046	0.009394
<b>TURN</b>	1.275436	1.208641	0.636843	0.528352
<b>S_CASH</b>	39.17769	87.70095	60.43439	78.51418
<b>S_RECE</b>	8.348319	11.15981	3.696988	3.967535

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**Table 2: Correlation between variables**

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	WOCA	PROFIT	EPS	LEVERAGE	CASP SHARE	TURN	SALE PERCA	S_RECE
<b>WOCA</b>	1							
<b>PROFIT</b>	0.052379	1						
<b>EPS</b>	0.160899	0.265316	1					
<b>LEVERAGE</b>	<b>-0.66259</b>	-0.062626	-0.04392	1				
<b>CASH</b>	-0.07045	0.048487	<b>0.508914</b>	0.16031	1			
<b>TURN</b>	0.048864	-0.147677	0.097536	-0.03704	0.04653	1		
<b>S_CASH</b>	-0.16683	0.022488	-0.062	0.102639	0.011915	0.222987	1	
<b>S_RECE</b>	-0.06228	-0.132704	0.071863	-0.11008	0.096172	<b>0.561496</b>	0.114702	1

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is computed by dividing sales by cash.

- S\_RECE is the ratio of sales to receivables, which is computed as total sales divided by total receivables.

We first provide a description of the data statistics to identify some differences between failed and healthy firms. Table 1 provides a summary of the arithmetic mean and standard deviation of eight independent variables of the two groups of companies.

On average, one year prior to failure, most of the financial ratios employed in the investigation of the healthy firm group are higher than those of the failure group. This observation is consistent with previous estimations that cash flow and profitability ratios are negatively related with the probability of failure.

Unlike these ratios mentioned above, the mean of LEVERAGE is higher for the failure firm group. This result is a clear illustration to support the statement that financial leverage is positively related to the probability of failure. Moreover, the S\_CASH is higher for companies in the distress state. The mean of S\_CASH for the failure group is twice as much as those

for the non – failure group. This indicates that an increase in sales is a good indicator for business; however, management of receivables is also important to avoid failure.

Table 2 shows the correlations amongst variables employed in this study. Most of the pair variables are not significantly correlated with each other. The exceptions are WOCA and LEVERAGE; CASH and EPS; and TURN and S\_RECE where the absolute correlation coefficients are higher than 0.5. To avoid the problem of multicollinearity, we do not include these pairs of variables in regression but each of them individually in a regression.

## 5. Results and discussion of results

Based on the results of pair wise correlation coefficients between eight explanatory variables presented, there are 8 possible regression models with each one containing 5 independent variables after excluding variables which are highly correlated with each other. The results are discussed as follows.

Coefficients on working capital are positive and significant in most regressions. The exception is in model 1 where the coefficient is pos-

**Table 3: Results**

Variable	Model 1			Model 2			Model 3			Model 4		
	Coefficient	Prob.		Coefficient	Prob.		Coefficient	Prob.		Coefficient	Prob.	
C	1.905946	0.0000		1.903546	0.0003		1.828481	0.0000		2.233043	0.0000	
WOCA	0.323463	0.6788					1.437497	0.0916				
PROFIT	-0.316477	0.5223		-0.37075	0.4616		-0.029329	0.9590		-0.187938	0.7389	
EPS	345.0324	0.0000		354.9522	0.0000		324.4049	0.0000		360.2532	0.0000	
LEVERAGE				0.104449	0.9032					-0.105499	0.9039	
TURN	1.428423	0.0007		1.444411	0.0006							
S_CASH	-0.002377	0.1141		-0.002467	0.0897		-0.002101	0.1394		-0.002043	0.1289	
S_RECE							0.198604	0.0043		0.171723	0.0089	
McFadden R-squared	0.298966			0.298455			0.292518			0.283148		
Prob(LR statistic)	0.0000			0.0000			0.0000			0.0000		
Obs with Dep=0	36			36			36			36		
Obs with Dep=1	946			946			946			946		
Model 5												
Variable	Model 5			Model 6			Model 7			Model 8		
	Coefficient	Prob.		Coefficient	Prob.		Coefficient	Prob.		Coefficient	Prob.	
C	1.085779	0.001		1.164864	0.0002		2.530663	0.0000		2.747885	0.0000	
WOCA	3.487755	0.0000		2.444658	0.0007		0.847624	0.052		1.340299	0.0169	
PROFIT	1.253483	0.021		0.677108	0.1158		-2.013271	0.0146		-1.722875	0.0356	
EPS										78.46636	0.0001	
LEVERAGE							1.257175	0.0006				
CASH	77.79161	0.0001		96.75102	0.0000		92.87835	0.0000				
TURN				1.163216	0.0013		-0.003141	0.0112				
S_CASH	-0.002601	0.0479		-0.002794	0.0418					-0.002334	0.0548	
S_RECE	0.191384	0.0028								0.132492	0.0197	
McFadden R-squared	0.217475			0.210934			0.193098			0.167191		
Prob(LR statistic)	0.0000			0.0000			0.0000			0.0000		
Obs with Dep=0	36			36			36			36		
Obs with Dep=1	946			946			946			946		



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stakeholders have been concerned with individual firm performance assessment. This study has been conducted to find out the relationship between a set of financial ratios and the probability of financial distress for listed companies in Viet Nam one year prior to failure.

It is generally believed that symptoms for financial distress of a firm can be observed prior to a state in which a firm encounters financial difficulty or even financial crisis. Our results indicate that firm financial ratios could be employed to analyze and predict an early warning of financial distress in firms. Indicators that could be employed to investigate the probability of firm financial distress are liquidity ratio, profitability ratio, cash flow ratio and asset turnover ratio as presented in the analysis.

Our results provide strong practical implications for both firm management, investors and authorities in evaluating firms and predicting firm financial distress. Firm management should focus attention on financial indicators over time and frequently evaluate these indicators to avoid leading firms into failure. Stock investors contemplate investing in firms should consider historical accounting indicators for stock selection. While holding stocks, investors also need to employ these accounting indicators to frequently evaluate and rebalance their portfolio according to their stated strategy. Controlling and supervisory authorities should use the analysis of firm accounting indicators for their market management responsibility and provide early warning for investors to avoid information asymmetry.

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